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# SOFIA - Simulating Reactor Functioning during Incident and Accident



**Code:** CO1023

**Session:**  
On demand

**Registration deadline:**  
3 months prior to course

**Duration:** 5 days  
Certificate of attendance will be issued to participants who attend the full course.

**Price:** Contact us!

**TO BE DESIGNED ACCORDING  
TO YOUR EXPECTATIONS**

## Objectives

To acquire a general knowledge on PWRs: understanding of physical phenomena under normal or accidental conditions.

## Target Audience

This training is intended for engineers which are interested to acquire general knowledge in the field of functioning and safety of pressurized water reactors (PWR) in normal, transient and accidental conditions.

## Learning Outcomes

Participants will acquire:

- A better understanding of the physical phenomena that occur in a PWR during normal operation, especially during the startup stage and under accident conditions.
- A global view of the main systems of the nuclear island used in normal and accident conditions, and of how they interact.
- An understanding of the main steps in normal operational procedures as the function of the main automatic controls of the plant unit, for different states of the plant (from cold shutdown state for maintenance to full power operation).
- An understanding of the main operational safety procedures under accident conditions (LOCA, SGTR).
- The ability to assess situations that can lead to severe accidents, such as loss of cooling water, loss of steam generator feedwater supply, or loss of power; demonstration through simulation of the Three Miles Island (TMI) and Fukushima accidents.

## Program

**The course focuses on lectures and practical work sessions on the SOFIA simulator.**

To perform some analysis of thermal hydraulics during a reactor accident or safety assessment and nuclear engineers training, the French authority ASNR uses his simulator SOFIA based on CATHARE (Code for Analysis of Thermal Hydraulics during an Accident of Reactor and Safety Evaluation). The french reference thermal-hydraulic system code used for nuclear safety analysis.

The five-days training sessions alternate class courses (2 days) and practical works on SOFIA simulator (3 days).

**The module will cover the following subjects:**

■ **PWR systems and normal reactor operation:**

- Introduction to PWR operation.
- Main PWR systems.
- General information and sequence leading to the hot shutdown state. Description of the CATHARE thermal-hydraulic code.
- Basics of core physics, divergence and core control.
- Divergence and power increase turbine coupling.

■ **Design basis accidents for PWR**

- Description of loss of coolant accidents (LOCA).
- Large-break LOCA transient (LB LOCA).
- Small-break LOCA transient (SB LOCA),
- Description of steam generator tube rupture (SGTR accidents).
- SGTR transient simulation.
- Use of accidental operating procedures for this different accident.

■ **Other PWR accidents:**

- TMI and Fukushima accidents.

## Prerequisites

Participants will require general knowledge on nuclear energy.

## Examination

Knowledge testing (multiple choice exam) will be performed on the full course content and successful candidates will be issued with a Knowledge Certificate.

## Teaching methods

Lectures, discussions and practical sessions are included.

Working group exercises and technical visits are supervised by experienced experts.

A USB stick containing the course material will be provided.